ISSN: 2350-0328
International Journal of AdvancedResearch in Science, Engineering and Technology
Vol. 6, Issue 4, April 2019

Change of Mechanical Properties of The Yarns Depending on The Layer of Reiler

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ABSTRACT: This article presents a study of the mechanical properties of yarn in laboratory conditions, developed on a small spinning installation "Shirley" of fibers after cleaning. Samples of raw cotton of the currently selected breeding variety Bukhara-6 were selected from the upper, middle and lower layers of the riot at the cotton-cleaning enterprise in the Jizzakh region. The data obtained were compared with the criteria.

KEY WORDS: quadratic unevenness, weed impurities, fiber strength, riot layers, elongation of yarn at break

I.INTRODUCTION

The mechanical properties of textile threads include strength, specific breaking load, quadratic unevenness in strength, elongation at break, and quadratic unevenness at elongation at break.

At the enterprises of primary processing of cotton, the influence of such processes as storing raw cotton in high density riots, drying, cleaning weed impurities, fiber separation, cleaning fibers from blemishes, for example, storing raw cotton in riots leads to negative consequences. As a result of compression in a riot with a high density, the pressure force increases, coarse dust is crushed, the degree of adhesion of fibers and trash impurities increases, which leads to a decrease in the efficiency of its cleaning. Therefore, it is necessary to create rational conditions for storing raw cotton in riots.

Practice shows that the natural properties of cotton fiber change over time, especially in the process of storage in riots, storage, drying, cleaning weed impurities, separating the fiber from the seed, cleaning the fibers and putting them in bales. Changes in these indicators are constantly occurring not only at the enterprises of primary cotton processing, but also in the processes of spinning, that is, in the processes of loosening, cleaning, combing, tape and roving, as well as spinning. This can have a negative impact on the production of high-quality products.

According to the standard, when dividing yarn into varieties, quality indicators of yarn include specific breaking load of yarn, quadratic unevenness in strength and quality indicator.

In the process of making textile yarns and finished products from them, the yarn experiences various mechanical effects. If the number of forces acting on a yarn exceeds its breaking load, the yarn is broken.

When producing spinning yarns of various types, the mechanical properties of cotton fiber, such as strength, degree of unevenness, length, resistance to fracture, compression, bending and shearing of fibers relative to each other, are of great importance. The yarn of any assortment produced at the spinning mills must meet the requirements of the standard for durability, extensibility, twist and unevenness.

The physicomechanical properties of the yarn produced directly depend on the quality of the raw material, that is, the better the fiber, the better the yarn can be produced from it. Fiber strength is also one of the main characteristics of the yarn. This property of the fiber is important when spinning. In addition, the more the fibers are stretched, the higher their elastic properties, and the greater the possibility of making durable yarn from them.

One of the main properties of the yarn is the length of the fibers in its composition. The length of the fibers is one of the main spinning properties, which determines the quality of the yarn.

The longer the fibers, the more durable and thinner the yarn can be made from them. From the longest fibers, the thinnest and strongest yarns are obtained, and from short and coarse fibers, thick and low-quality yarns are obtained. Longer cotton fiber, usually thinner. In general, cotton fiber is shorter than other fibers. Therefore, every millimeter of cotton fiber is of great importance.

If the length of cotton fiber is reduced by 0.5 mm, the company will suffer heavy losses. Therefore, at spinning

ISSN: 2350-0328
International Journal of AdvancedResearch in Science, Engineering and Technology
Vol. 6, Issue 4, April 2019

enterprises it is necessary to select the type sorting correctly, to choose the optimal parameters of the subsequent technological processes.

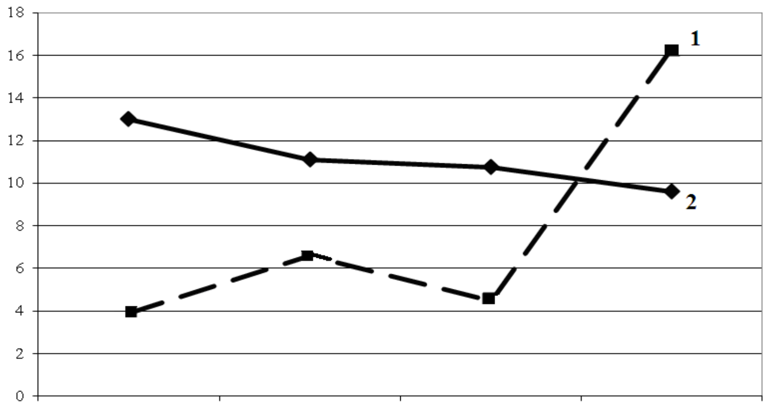
In order to develop high-quality yarn in a market economy at the spinning industry, research work was carried out. At the same time, in laboratory conditions, indicators of the quality of yarn produced from fibers stored in various parts of the riot were determined. The results are shown in table-1.

Table 1

The influence of layers of riot and technological processes on yarn quality indicators

№	Indicators	Unclaimed cotton	Layers of riot		
			Upper	Average	Lower
1.	Yarn breaking load, sN	261,78	221,12	214,95	189,73
2.	Yarn breaking load, cN / tex	13,02	11,11	10,75	9,61
3.	Quadratic uneven yarn on breaking load,%	3,88	6,58	4,49	16,36
4.	Yarn elongation at break,%	7,48	6,94	6,89	6,24
5.	Quadratic uneven elongation of yarn at break,%	4,02	4,8	6,7	7,9

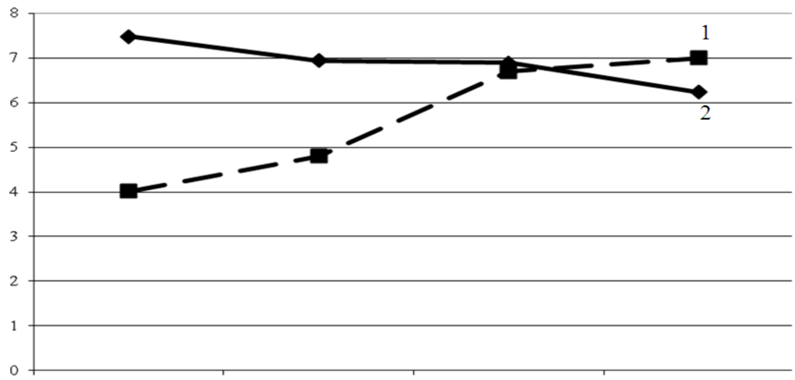
Based on the results obtained, Figures 1-3 show graphs of changes in the breaking load of the yarn, the specific breaking load, quadratic unevenness of the breaking load, elongation at break, quadratic unevenness of the elongation at break depending on the influence of the layers of rebellion and technological processes.



Not stored in riots *Top of riot* *Middle riot* *Bottom riot*

1- quadratic unevenness at breaking load;
2 - specific breaking load.

Fig-1. Specific breaking load of yarn and quadratic unevenness on breaking load



Not stored in riots *Top of riot* *Middle riot* *Bottom riot*

1-square uneven elongation at break;
2- elongation at break.

Fig-2. Yarn elongation at break and quadratic unevenness of yarn elongation at break

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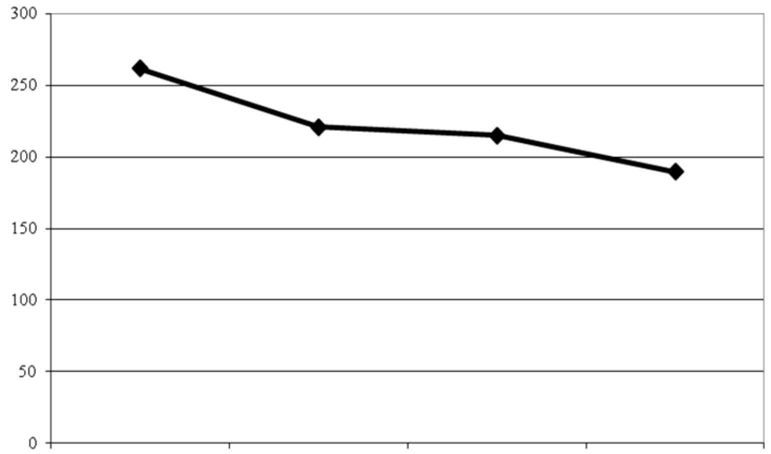

Fig-3. Yarn breaking load change.

When comparing the obtained results with indicators of yarn produced from cotton not stored in riots, it can be noted that the breaking load of yarn produced from cotton stored in the upper part of the riot decreased by 15.5%, the specific breaking load by 14.7%, quadratic unevenness for breaking load increased by 41.1%, elongation at break by 7.2% decreased, and quadratic unevenness at break increased by 16.2%, breaking load of yarn produced from cotton stored in the middle part of the riot reduced cumming by 17.9%, specific breaking load by 17.4%, quadratic unevenness of breaking load increased by 13.6%, elongation at break by 7.9% decreased, and quadratic unevenness at elongation at breaking increased by 33.0 %, the breaking load of the yarn produced from cotton stored in the lower part of the riot decreased by 27.5%, the specific breaking load by 26.2%, the quadratic unevenness of the breaking load increased by 74.3%, the elongation at break was reduced by 6.6 %, and the quadratic unevenness in elongation at break increased by 42.6%.

Analysis of the research results shows that as a result of storing cotton in riots with high density, the yarn decreased the breaking load, the specific breaking load, increased the quadratic unevenness of the breaking load, decreased elongation at break, and the quadratic unevenness at elongation at break increased.

When cotton is stored in riots, the quality indicators of the fiber deteriorate and the unevenness of the yarn produced increases.

According to the results, the breaking load of yarn decreased from 17.9% to 27.5%, the specific breaking load decreased from 14.7% to 26.2%, quadratic unevenness increased from 13.6% to 74.3%, elongation at rupture decreased from 6.6% to 7.9%, quadratic unevenness in elongation at break increased from 16.2% to 42.6%. As can be seen from the analysis of the results, it is advisable to produce the yarn from cottonwood without storing it in riots.

After studying the physicomechanical properties of yarn produced under the influence of various technological processes from cotton of different layers of riot, the obtained test results were substantiated, i.e. strength and specific breaking load of the yarn were compared according to the criteria of Fisher and Student.

Compare the results of the tests according to the criteria of Fisher and Student.

By yarn strength

Yarn made from the cotton of the upper layers of the riot

$$S_1^2 = 10{,}15^2 = 103 \quad y_1 = 261{,}78$$

Yarn produced after the cleaning process

$$S_2^2 = 15{,}73^2 = 247{,}4 \quad y_2 = 221{,}26$$

$$F_p = \frac{247{,}4}{103} = 2{,}04$$

$$F_p = 2{,}04 < 3{,}18 = t_c$$

According to the Fisher criterion, the variance of the yarn is the same and their average is equal. X_o .

ISSN: 2350-0328
International Journal of AdvancedResearch in Science, Engineering and Technology
Vol. 6, Issue 4, April 2019

Average dispersion

$$S^2\{y\}=\frac{(m-1)S_1^2\{y\}+(m-1)S_2^2\{y\}}{m_1+m_2-2}=\frac{(10-1)\cdot 103+(10-1)\cdot 247{,}4}{10+10-2}=175{,}2$$

According to the criterion of Styudenta

$$t_R=\frac{(y_1-y_2)}{S^2\{y\}}\sqrt{\frac{m_1\cdot m_2}{m_1+m_2}}=\frac{261{,}78-221{,}26}{175{,}2}\sqrt{\frac{10\cdot 10}{10+10}}=0{,}51$$

$$t_R=0{,}51<3{,}18=t_c$$

By Student's criterion, the average values of these threads are considered the same.
By breaking load of yarn
Yarn made from the cotton of the upper layers of the riot

$$S_1^2=0{,}51^2=0{,}26\quad y_1=13{,}02$$

Yarn produced after the cleaning process

$$S_2^2=0{,}79^2=0{,}62\quad y_2=11{,}06$$

$$F_x=\frac{0{,}62}{0{,}26}=2{,}4$$

$$F_x=2{,}4<3{,}18=t_c$$

According to the Fisher criterion, the variance of the yarn is the same and their average is X_o.
Average dispersion

$$S^2\{y\}=\frac{(m-1)S_1^2\{y\}+(m-1)S_2^2\{y\}}{m_1+m_2-2}=\frac{(10-1)\cdot 0{,}26+(10-1)\cdot 0{,}62}{10+10-2}=0{,}44$$

According to the criterion of Styudenta

$$t_R=\frac{(y_1-y_2)}{S^2\{y\}}\sqrt{\frac{m_1\cdot m_2}{m_1+m_2}}=\frac{13{,}02-11{,}06}{0{,}44}\sqrt{\frac{10\cdot 10}{10+10}}=9{,}8$$

$$t_R=9{,}8\succ 3{,}18=t_c$$

According to the student's criterion, the average values of these threads are considered the same.
By yarn strength
Yarn made from cotton of middle layers of riot

$$S_1^2=14{,}56^2=211{,}9\quad y_1=221{,}12$$

Yarn produced after the cleaning process

$$S_2^2=15{,}87^2=251{,}9\quad y_2=209{,}50$$

$$F_x=\frac{251{,}9}{211{,}9}=1{,}19$$

$$F_x=1{,}19<3{,}18=t_c$$

According to the Fisher criterion, the variance of the yarn is the same and their average is X_o.
Average dispersion

$$S^2\{y\}=\frac{(m-1)S_1^2\{y\}+(m-1)S_2^2\{y\}}{m_1+m_2-2}=\frac{(10-1)\cdot 211{,}9+(10-1)\cdot 251{,}9}{10+10-2}=231{,}9$$

According to the criterion of Styudenta

ISSN: 2350-0328
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Vol. 6, Issue 4, April 2019

$$t_R = \frac{(y_1 - y_2)}{S^2\{y\}}\sqrt{\frac{m_1 \cdot m_2}{m_1 + m_2}} = \frac{221{,}12 - 209{,}5}{231{,}9}\sqrt{\frac{10 \cdot 10}{10+10}} = 0{,}11$$

$$t_R = 0{,}11 < 3{,}18 = t_c$$

According to the Styudenta criterion, the average values of these threads are considered the same.
By specific breaking load
Yarn made from cotton of middle layers of riot

$$S_1^2 = 0{,}73^2 = 0{,}53 \quad y_1 = 11{,}11$$

Yarn produced after the cleaning process

$$S_2^2 = 0{,}81^2 = 0{,}66 \quad y_2 = 10{,}63$$

$$F_x = \frac{0{,}66}{0{,}53} = 1{,}25$$

$$F_x = 1{,}25 < 3{,}18 = t_c$$

According to the Fisher criterion, the variance of the yarn is the same and their average is X_o.
Average dispersion

$$S^2\{y\} = \frac{(m-1)S_1^2\{y\} + (m-1)S_2^2\{y\}}{m_1 + m_2 - 2} = \frac{(10-1)\cdot 0{,}53 + (10-1)\cdot 0{,}66}{10+10-2} = 0{,}60$$

According to the criterion of Styudenta

$$t_R = \frac{(y_1 - y_2)}{S^2\{y\}}\sqrt{\frac{m_1 \cdot m_2}{m_1 + m_2}} = \frac{11{,}11 - 10{,}63}{0{,}60}\sqrt{\frac{10 \cdot 10}{10+10}} = 1{,}76$$

$$t_R = 1{,}76 < 3{,}18 = t_c$$

According to the Styudenta criterion, the average values of these threads are considered the same.
By yarn strength
Yarn made from cotton undercoat riot

$$S_1^2 = 9{,}65^2 = 93{,}12 \quad y_1 = 214{,}95$$

Yarn produced after the cleaning process

$$S_2^2 = 31{,}03^2 = 962{,}9 \quad y_2 = 189{,}73$$

$$F_x = \frac{962{,}9}{93{,}12} = 10{,}34$$

$$F_x = 10{,}34 \succ 3{,}18 = t_c$$

According to the Fisher criterion, the variance of the yarn is the same and their average is X_o.
Average dispersion

$$S^2\{y\} = \frac{(m-1)S_1^2\{y\} + (m-1)S_2^2\{y\}}{m_1 + m_2 - 2} = \frac{(10-1)\cdot 93{,}12 + (10-1)\cdot 962{,}9}{10+10-2} = 528$$

According to the criterion of Styudenta

$$t_R = \frac{(y_1 - y_2)}{S^2\{y\}}\sqrt{\frac{m_1 \cdot m_2}{m_1 + m_2}} = \frac{214{,}95 - 189{,}73}{528}\sqrt{\frac{10 \cdot 10}{10+10}} = 0{,}11$$

$$t_R = 0{,}11 < 3{,}18 = t_c$$

According to the Styudenta criterion, the average values of these threads are considered the same.
By specific breaking load
Yarn made from cotton undercoat riot

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Vol. 6, Issue 4, April 2019

$$S_1^2 = 0{,}48^2 = 0{,}23 \quad y_1 = 10{,}75$$

Yarn produced after the cleaning process

$$S_2^2 = 1{,}57^2 = 2{,}46 \quad y_2 = 9{,}61$$

$$F_x = \frac{2{,}46}{0{,}23} = 10{,}7$$

$$F_x = 10{,}7 \succ 3{,}18 = t_c$$

According to the Fisher criterion, the variance of the yarn is the same and their average is X_o.

Average dispersion

$$S^2\{y\} = \frac{(m-1)S_1^2\{y\} + (m-1)S_2^2\{y\}}{m_1 + m_2 - 2} = \frac{(10-1)\cdot 0{,}23 + (10-1)\cdot 2{,}46}{10+10-2} = 1{,}35$$

According to the criterion of Styudenta

$$t_R = \frac{(y_1 - y_2)}{S^2\{y\}}\sqrt{\frac{m_1 \cdot m_2}{m_1 + m_2}} = \frac{10{,}75 - 9{,}61}{1{,}35}\sqrt{\frac{10\cdot 10}{10+10}} = 1{,}86$$

$$t_R = 1{,}86 < 3{,}18 = t_c$$

According to the Styudenta criterion, the average values of these threads are considered the same.

The results of the analysis showed that indicators of yarn produced from cotton not stored in riots, dispersion of yarn according to Fisher's criterion and average values of these threads according to Student's criterion differ dramatically compared to indicators of cotton yarn from lower layers of riot.

II. CONCLUSION AND FUTURE WORK

1. It was established that the breaking load of the yarn decreased from 17.9% to 27.5%, the specific breaking load decreased from 14.7% to 26.2%, quadratic unevenness increased from 13.6% to 74.3%, elongation at rupture decreased from 6.6% to 7.9%, quadratic unevenness in elongation at break increased from 16.2% to 42.6%. As can be seen from the analysis of the results, it is advisable to produce the yarn from cottonwood without storing it in riots.
2. After studying the physicomechanical properties of yarn produced under the influence of various technological processes from cotton of different layers of riot, the obtained test results were substantiated, i.e. strength and specific breaking load of the yarn were compared according to the criteria of Fisher and Styudenta. The results of the analysis showed that indicators of yarn produced from cotton, not stored in riots, dispersion of yarn according to Fisher's criterion and average values of these threads according to Student's criterion differ dramatically compared to indicators of cotton yarn from lower layers of riot.
3. In a market economy, it is recommended to store cotton in low-density riots in order to produce high-quality products at primary cotton processing plants and spinning mills.

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